impressionistic as those which outline so satisfactorily each of the component parts. Such a chapter, it would appear, the author might well have worked in to the advantage of this otherwise excellent book without attempting to make it a complete geography of France with full treatment of distributions, physical and human, which can quite well be sought for in other books and atlases. Illustration is limited to a few block diagrams, and it is essential that a good atlas be before the reader; and where possible the maps of the Service Géographique de l'Armée—either on 1 : 600,000 or 1 : 200,000—should be consulted.

Having noted these omissions we may characterize M. de Martonne's work by stating that we know of no more concise and telling geographical description at once vivid and explanatory which has so successfully encompassed a territory of the area and variety of France within 190 short pages. Not a word is superfluous, and the style is easy and attractive. With his reputation as a physical geographer the author could be counted on to provide lucid accounts of the various land forms and their origin. These are present but not overweighted, and they are deftly worked into landscape description in such a way that man is the central figure. Nowhere is local patriotism stronger than in France; and in no civilized country is man more directly dependent upon the soil. France excels, then, as a field for the study of the relationships between man and his habitat, and we are grateful to Professor de Martonne for presenting a great subject in simple language.

The Rocky Mountain Trench

S. J. Schofield. **The Origin of the Rocky Mountain Trench, B. C.** Maps, diagrs. *Proc. and Trans. Royal Soc. of Canada*, Ser. 3, Vol. 14, 1920, Section IV, pp. 61–97.

F. P. Shepard. **The Structural Relation of the Purcell Range and the Rocky Mountains of Canada.** Maps, diagrs. *Journ. of Geol.*, Vol. 30, 1922, No. 2, pp. 130–139.

Because the Rocky Mountain trench is the "most remarkable structural feature of the Canadian Cordillera" any addition to our knowledge of it is of wide geographical interest. The trench forms the western boundary of the Rocky Mountains of Canada practically throughout its whole length for a distance of over 800 miles. Its direction is almost constant north 33° west. In it are the headwaters of nine considerable streams. The sides of the trench rise on an average 4,500 feet above the valley floor; the width averages 4 to 6 miles; the floor is flat or slightly rolling; and, finally, glaciation has smoothed and trimmed its interlocking spurs to such an extent as to increase its linear quality and give it its modern trough-like characteristics.

Of particular interest in physiography are the series of cross sections on page 74 of Schofield's paper and the accompanying discussion of evidences of faulting. Schofield, following Daly, considers that the origin of the trench in an almost continuous zone of faulting is now well established. It is his belief that sharp changes in rock character in short distances at a few localities where actual faults have been observed and other pronounced structural features from which faulting is clearly inferred furnish a strong basis for a definite conclusion on this question. The normal faulting in evidence probably took place in Eocene time. It produced not only a depression but also a zone of shearing along which rivers would tend to erode rapidly. The author discusses at some length the effects of erosion in Cretaceous time and the reduction of the highlands to a peneplain. In this fact and in subsequent broad crustal movements, coupled with the structural features of the Rocky Mountain trench, we have an explanation of the drainage relations of today. These relations are traced out in considerable detail; but the history of Pleistocene and recent drainage in British Columbia is not discussed, the reader being referred to Dawson's famous paper read before the Royal Society of Canada in 1889.

Shepard takes issue with Schofield and Daly with respect to the explanation outlined above. From a study of 180 miles of the Rocky Mountain trench between Gateway, Mont., and Golden, B. C., he concludes that it is not a unit in development and structure but that its different parts have had different origins—"partly by normal erosion, partly by erosion along lines of structural weakness, and partly by the escarpment of a fault (*sic*)." The faulting adjudged to be operative was of the thrust rather than of the normal type. It was a zone of weakness at the present locus of the trench in the Purcell Mountain region, caused by the intersection of a large number of fault planes, that hastened the erosive processes.

In the central section of the stretch studied by Shepard (Canal Flats to Bull River) there appears to be no relation between the trend of the trench and the structural lines. From this fact and the great width of this part of the trench, greater age is inferred, such as would be associated with a peneplaned surface where drainage had freed itself from the bondage of earlier structural and topographic controls.

Drift of the Earth's Crust and Displacement of the Pole

Alfred Wegener. **Die Entstehung der Kontinente und Ozeane.** 2nd edit. viii and 135 pp.; maps, diagrs., index. *Die Wissenschaft: Sammlung von Einzeldarstellungen aus den Gebieten der Naturwissenschaft und der Technik No. 66.* Friedr. Vieweg & Son, Brunswick, 1920.

Wladimir Köppen. **Polwanderungen, Verschiebungen der Kontinente und Klimageschichte.** Maps, diagrs. *Petermanns Mitt.*, Vol. 67, 1921, January-February, pp. 1–8; March, pp. 57–63.

Wladimir Köppen. **Ursachen und Wirkungen der Kontinentenverschiebungen und Polwanderungen.** Diagrs. *Petermanns Mitt.*, Vol. 67, 1921, July–August, pp. 145–149; September, pp. 191–194.

The authors are meteorologists stationed at the Marine Observatory at Hamburg; they have apparently worked more or less in conjunction and cover very much the same ground in their publications. Wegener is more detailed in his description of the displacements of the continents; Köppen, of the changes of the earth's axis of rotation. The picture they present of the history of the earth's crust is as follows. The material of the upper 1,500 kilometers of the earth's crust is of two kinds, Suess' *sima* (rock rich in magnesium) and *sial* (rich in aluminium), Suess' *sal.* The latter is less dense than the former, is very much less in amount, and floats in it as icebergs float in water. The authors draw confirmation of this idea from the hypsometric curve, and Wegener gives a rather striking diagram of the relative areas at different levels of the lithosphere, showing the preponderance of a continental and an oceanic plateau, as first described by Murray. The sima is highly viscous and reacts as a solid to temporary forces but yields to long-continued forces. The sial is much more rigid and, though capable of being folded, is more apt to fracture. At the beginning of geological time, the sima layer was entirely covered by a mantle of sial about 30 kilometers thick. For some reason not given, this broke up and the sial collected together in a single mass (with some gaps), about 100 kilometers thick, to form the continents. Then the process was reversed, and one part after another broke away and floated off, with the result finally of the present distribution of the continents. By selecting the times of the various disruptions, by assuming great changes in the position of the earth's poles, and by introducing other hypotheses where needed the authors attempt to account for the variations in geological climates, for the distribution of former and recent fauna and flora, for glaciation and for many mountain chains. During Carboniferous and Permian times the disruption had scarcely started: the American continents were in contact with Europe and Africa; the latter, Antarctica, Australia, and India (which then stretched far to the south) were continuous; and the south pole of the earth lay in southern Africa. The existence of a common Permian glaciation in these countries is thus accounted for, for the authors think that strong glaciation is due to nearness to a pole lying in a land area. They overlook the evidence of glaciation in the mid-Carboniferous in Oklahoma and in the Permian in Massachusetts, England, and Germany—regions which were then quite close to their equator. Some similarities in the geological fauna and flora of the southern areas are also explained by their juxtaposition. The two parts of the Hercynian mountain range of the eastern and western hemispheres were united, as the north Atlantic ocean had not yet been formed. In the Eocene, things began to happen. Taking Africa as our point of reference, we may consider it at rest; Australia broke away and moved off to the east; Antarctica slipped off to the south; India to the northeast, crumpling up the mass in front of it to form the Himalayas; South America began to pull away from South Africa; but it was not until the Quaternary that northeastern North America, Greenland, and northwestern Europe were torn apart. Hence the distribution of glaciation during the Pleistocene ice age in the two continents, for, at that time, the north pole is supposed to have been in the present north Atlantic and about 20° from its present position.